

SECTION 052100 - STEEL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this section.

1.2 SECTION INCLUDES

- A. Short span
- B. Bridging, anchorages, headers and framing required to make a complete and rigid job.
- C. Wall anchors at the ends of each line of bridging.
- D. Shop painting, cleaning and touch-up of paint at field welds and at other points where shop coat is damaged.

1.3 RELATED WORK

- A. All other sections of Division 5, Metals.

1.4 DESIGN CRITERIA

- A. Building structure designed based on SJI. joist sizes selected and shown on the drawings.
- B. Allowable Deflection: Design and fabricate for a maximum deflection of $L/360$ of the clear span including the required uniform live load, for all areas having suspended ceilings below.
- C. Top Chords: Design for combined bending and direct stresses for live and dead loads. Top chord extensions shall extend back into joist to fully develop bending and shear stresses.
- D. Wind Uplift: All bar joists shall be designed to resist a net wind uplift of 40 psf for a 12'-0" x 12'-0" area at all exterior building corners, 35 psf for a 12'-0" width around the entire building perimeter, and 30 psf for all other roof areas. Locate bridging near the first bottom chord panel point and design all joist members to satisfy this additional loading condition.

1.5 QUALITY ASSURANCE

- A. Joists: Fabricated in compliance with the references, specifically the requirements of span and loading as indicated by joist designation on the drawings.
- B. Manufacturers Qualifications: Member Steel Joist Institute.
- C. Welding Qualifications: Qualify welding processes and welders in accordance with the AWS - "Standard Qualification Procedure."

1.6 REFERENCES

- A. Steel Joist Institute (SJI):
 - 1. Standard Specifications and Load Tables - Open Web Steel Joists
 - 2. Short Span Steel Joists - K Series
- B. American Institute of Steel Construction (AISC): "Manual of Steel Construction"
 - 1. Allowable Stress Design (ASD) - Ninth Edition
 - 2. Load and Resistance Factor Design (LRFD) - Third Edition
- C. American Iron and Steel Institute (AISI): Specification for the Design of Cold-Formed Steel Structural Members
- D. Steel Structures Painting Council (SSPC): Steel Structures Painting Manual, Volume 1 and Volume 2, Systems and Specifications, by Steel Structures Painting Council.
- E. American Welding Society (AWS): D1.1 Structural Welding Code Standard Qualification Procedures

1.7 SUBMITTALS

- A. Shop Drawings: Show layout of joist units, special connections, jointing and accessories. Include the mark, number, type, location and spacing of joists and bridging. **Please note that the Contract Documents in CADD format will not be made available to the contractor for their use in the preparation of the shop drawings, unless a release is signed, and a fee is paid for each cadd file requested.**
- B. Certification: That joists comply with "AISC-SJI. Specifications".
- C. Product Data: Specifications and installation instructions for each type of joist and its accessories.

1.8 DELIVERY, STORAGE HANDLING

- A. Product Handling: As recommended in "AISC-SJI. Specifications". Handling and storage: Prevent deformation of members and excessive stresses.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel: Comply with "AISC-SJI. Specifications":
- B. Threaded Fasteners:
 - 1. ASTM A-325 heavy hexagon structural bolts with nuts and hardened washers.

C. Prime Paint: AISC-SJI. Specifications, Type I Grey oxide; Type II Asphaltic not permitted.

1. Manufacturers:
 - a. Tnemec Company - No. 99 Grey Primer
 - b. Or approved equal

2.2 SHORT SPAN STEEL JOISTS (K SERIES)

A. Design and fabricate in accordance with "AISC SJI. Standard Specifications and Load Tables for Short Span Steel Joists, K-Series."

B. Bearing Ends: Extend a minimum distance of 2-1/2 inches on steel supports, and a minimum of 4 inches on masonry and concrete supports.

2.3 FABRICATION

A. General: Fabricate in accordance with "AISC-SJI. Specifications."

1. Camber: Fabricate joists with camber as noted or indicated on drawings.

B. Extended Ends: Provide top chord extended ends on joists; design to support uniform loads indicated in "SJI. Specifications and Load Tables."

1. Design as cantilever beams with reactions carried back to not less than the first panel point of the joists.
2. Cantilevered extended ends shall be designed for a maximum live load deflection of the cantilevered length divided by 240 ($L_c/240$).

C. Ceiling Extension: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord.

1. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards.
2. Sufficient strength to support the ceiling construction within deflection limit indicated.
3. Extend ends to within 1" of the finished wall surface, unless otherwise indicated.

D. End Anchorage and Bearing Plates: Provide end anchorages to secure joists to adjacent construction, comply with "AISC-SJI. Specifications" except as indicated.

1. Include beveled end bearings for installations where slope exceeds 1/4 inch (6.35 mm) in 12 inches (304.8 mm).

E. Header Units: Provide header units to support tail joists at openings in floor or roof system.

F. Bridging and Sag Rods: Provide bridging, sag rods and anchors for ends of lines, terminate at walls or beams.

G. Shop Painting: Shop paint all steel joists and joist girders except members or portion of members to be embedded in concrete or sprayed on fireproofing. Paint embedded steel on exposed portions and initial 2 inches of embedded areas only.

1. Remove loose scale, heavy rust, and other foreign materials from joists and accessories before application of shop paint in accordance with SSPC SP-2 "Hand Tool Cleaning" and SP-3 "Power Tool Cleaning."
2. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning."
3. Apply one shop coat of rust inhibitive prime paint to steel joists and accessories, by spray, dipping, or other method.
4. Provide continuous minimum dry film thickness of not less than 1.0 mils.
5. Another coat shall be applied, at the time of erection, if the original protection has deteriorated in any manner.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Erector must examine the areas and conditions under which steel joists are to be installed and provide notification in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 ERECTION

- A. Placing Joists: Place and secure steel joist in accordance with "AISC-SJI. Specifications" and as herein specified. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.
 1. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.
 2. Do not place construction loads upon joists, until joists and bridging are securely in place.
 3. Maximum spacing of joists is shown in plans on the structural drawings. Joists shall be spaced less than maximum distance shown in plans where it is necessary to avoid pipes, openings, parallel partitions, etc.
 4. Set joists accurately, in proper locations. Alignment of each joist in place shall not deviate more than 3/8" in 10 feet from a straight line.
 5. Bearing surfaces of the joists shall be in the same plane with full bearing on supports and anchored as indicated. For joist ends bearing on masonry, provide solid level bearing of 8" minimum depth filled with concrete.
 6. Strut joists at columns shall have top chords bolted to structural members and the bottom chords shall be extended. The top chords shall be welded to structural members after field adjustments. See structural details.
- B. Attachment:
 1. Welding: Field weld joists to supporting steel frame work in accordance with AISC-SJI. Specifications for the type of joists used. Coordinate welding sequence and procedure with the placing of joists.
 2. Anchors: Furnish anchor bolts and other devices to be built into concrete and masonry construction. Furnish templates for accurate location of anchors to other work. Hook

anchors not permitted.

C. Bridging:

1. Install bridging immediately after joists are erected. Brace end joists laterally by anchors or ties at each line of bridging.
2. Type as noted or detailed on structural drawings. Bridge both bottom and top chords. Weld all bridging.
 - a. Install parallel bridging for short span joist and promptly after placing joist.
 - b. Where 4 or 5 rows of bridging are required, a row nearest the midspan of the joist shall be diagonal bridging with bolted connections at chords and intersections.
3. Interruption of bridging: (e.g. ducts, suspended HVAC units, recessed light fixtures, etc.) Provide bridging at each end of such items that will overlap line of standard bridging.
4. Joists to be exposed in finished areas: Erect bridging in line with all sections straight, neatly installed and coordinated with building features.

3.3 PROTECTION

- A. Distribute all construction loads so that carrying capacity of each joist is not exceeded.
- B. Joists shall not be moved or cut, after permanently set, except under written direction of the Architect.

3.4 DEFECTIVE WORK

- A. Joists with bent chords or web members, poor welds or other defects, will be rejected and must be replaced with material meeting these specifications.

3.5 TOUCH-UP PAINTING

- A. After joist installation, paint all field bolt heads and nuts, and welded areas, abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and clean with solvent before painting. Use the same type of paint as used for shop painting.

3.6 INSPECTION AND TESTING

- A. General: Joists welded in place are subject to inspection and testing. Expense of removing and replacing any portion of the steel joists for testing purposes will be borne by the Owner if welds are found to be satisfactory. Remove and replace any work found to be defective and provide new acceptable work.
 1. The Owner shall employ and pay for an inspection agency approved by the Architect to inspect the joist.
 2. Documents: Provide the inspection agency with a complete set of Contract Documents and approved shop drawings before the work is started.
 3. Notification: The Contractor shall notify the inspection agency before the start of erection of steel joists in order that the inspector may properly schedule the required inspections.

B. Mill Test Reports:

1. Furnish the inspection agency a copy of the certified mill test reports of chemical analysis and physical test for each heat number of structural steel.
2. Furnish an affidavit (six copies) from steel manufacturer, stating that steel furnished for the project complies with the specifications.

C. Shop Inspection includes:

1. General inspection of the joist fabrication, including welding and required camber.
2. Shop inspection shall be made in the field prior to erection of joist.
3. Mill Certificates shall be reviewed and approved by the inspection agency prior to fabrication.

D. Field Inspection includes:

1. Setting of bearing plates when required.
2. Field welding of joists to supports.
3. Bridging installation and materials.
4. Anchorage requirements called for on the drawings.
5. Alignment of adjacent joists.
6. Field touch-up of paint and painting of field welds prior to placement of deck.

E. Written Certification:

1. Upon completion of the installation of all steel joists, the inspection agency shall submit written certification that the joists as manufactured meet all the requirements of the Contract Documents.

3.7 CONTRACTOR'S RESPONSIBILITY

- A. Acceptance of the shop and field inspection done by the testing agency pertaining to the structural steel, does not relieve the Contractor of his responsibility to insure that the project has the proper sizes, strength, fabrication and erection procedures and any other requirements of the Contract Documents.
- B. Submit copies of all reports indicating conformance and exceptions to contract documents in a timely fashion to General Contractor for distribution to design consultants, owner, subcontractors and other interested parties.
- C. Final Report: The Inspection Agency shall prepare a written report that summarizes the work inspected during the course of the project, and certifies that the work meets the requirements of the contract documents, specifications, and all governing agencies.

END OF SECTION 052100